Title: The Big Chill

Link to Outcomes:

- **Problem Solving** Students will solve a real-life situation using mathematical reasoning within a cooperative team setting.
- **Communication** Students will communicate scientifically and mathematically using models, diagrams, and tables.
- **Connections** Students will link mathematics to real-life scientific situations.
- **Estimation** Students will apply estimation strategies and computation skills while completing scientific measurements.
- **Measurement** Students will demonstrate and apply concepts of metric measurements to estimate, verify, and solve a real-life situation.

Brief Overview:

In cooperative learning groups, students will use their knowledge of insulation to construct a device to keep an ice cube from melting. They will collect data and draw conclusions about their findings.

Grade/Level:

Grades 3 - 5

Duration/Length:

This lesson is designed to take approximately four 50-minute class periods over 4 days.

Prerequisite Knowledge:

Students will need a basic understanding of:

- computing elapsed time
- measuring mass in metric units
- computing an average
- subtracting whole numbers

Objectives:

In this unit the students will:

- construct a model.
- draw and label a diagram.
- complete a table.
- estimate, then find mass.
- compute differences and averages.
- compute elapsed time.
- read and interpret data.
- write a conclusion.
- predict outcomes.
- justify a position.

Materials/Resources/Printed Materials:

- Ice cubes
- Roll of plastic wrap
- Student worksheets
- Balances
- Gram stackers
- Classroom clock
- Calculators (optional)
- Overhead projector / transparencies
- Cooler for ice cube storage (freezer blocks may be necessary)
- Variety of materials for insulation (student-generated, from home)

Development/Procedures:

Day One:

- Develop a definition of insulation through class discussion, or based on research and readings (or both).

- Generate a list of real-life situations which illustrates both hot and cold insulators. Examples: thermos bottles, ice chests, foam around pipes, fiberglass between walls.

- Divide class into 3-4 person teams.

- Set the purpose for the activity. Allow time for the teams to brainstorm for materials to use in insulating their ice cubes. Put emphasis on the use of non-commercial materials.

Day Two:

- Review the purpose of the activity. Pass out student worksheet (Part 1) and discuss.

- Have teams use the materials to design the insulation models, writing down the procedures as they construct them.

Day Three:

- Pass out balances, gram stackers, and plastic wrap. Show class an ice cube and have teams estimate its mass, recording it in their tables.

- Quickly pass out an ice cube to each group, have them find its mass, wrap it in plastic, and place in insulation model. Note the starting time as a class, then calculate the elapsed time of 40 minutes. Record the ending time. Using the actual mass of the ice cube, record the estimated final mass of the cube.

- During the 40 minutes melting time, each group presents a short presentation on their insulator. Each team will then predict the best insulator based on the presentations. Note: Encourage teams to make notes so that they can give a complete justification of their choice later.

- When 40 minutes have elapsed, the ice cube is removed, weighed, and its mass recorded (quickly!).

Day Four:

- Have each team record the before/ after masses and the difference between them on an overhead transparency. Teams will be recording the data from others on their worksheets. When all teams have presented, the class averages will be calculated.

- Discuss the results, including which design worked best based on the data, and how each team's design compared to the winner and the class average.

- Complete worksheet.

Evaluation:

- Teacher observation of group interaction
- Teacher evaluation of student worksheet

Extension/Follow Up:

- Compute other statistics : mode, range, median, (measures of central tendency).
- Measure core temperature of model.
- Graph results of data.
- Creative writing-- suggested prompt: One day while out walking, I began to feel very cold. Suddenly, I became an ice cube. Alternatively, try ice cube poetry.
- Compete with other classes to find the best insulation model.

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The Big Chill Team members_____

PART 1 -- Model Plans

A. List materials:

B. Draw and label a diagram of your team's proposed model.

C. Procedure: Using numbered steps, describe how you plan to construct your model.

STOP!

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PART 2

A. Team results

Cube Mass -- BEFORE	Cube MASS -- AFTER	Difference
Estimated: Actual:	Estimated: Actual:	Estimated: Actual:

B. Time Beginning time: _____ Elapsed time: _____ Ending Time: _____

STOP!

C. Predictions:

Based on the team presentations, which team has the best design? Provide three reasons that give supporting evidence for your prediction.

STOP!

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Part 3

A. Class Results

Title:_____

Groups	Mass-BEFORE	Mass- AFTER	Difference
TOTAL:			
Average:			

B. Conclusions:

1. Based on the above data, how did your design rank (1st, 2nd, 3rd, . . .)? Explain how you determined this.

2. Was your prediction in Part 2 about the best design correct? Explain your answer.

GO ON. . .

The Big Chill Part 3 (continued)

3. Was this a fair test to determine the best insulation design? Explain.

4. You can't afford to buy an insulation device to keep your lunch box drink cold. Based on this activity, what items could you use to keep your drink cold/ cool until lunch? Explain your reasoning.

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TITLE:_____

Groups	Mass-BEFORE	Mass-AFTER	Difference
TOTAL:			
Average:			